

above, and an arm having a suspension on which the head slider is mounted. The magnetic recording/reproducing system of the invention is characterized by comprising a magnetic recording medium, and a head slider provided with the separated recording/reproducing magnetic head of the invention noted above with which signals are written on the magnetic recording medium in a magnetic field and signals are read in the magnetic field as generated by the magnetic recording medium.

The magnetoresistance effect device of the invention mentioned above is applicable not only to magnetoresistance effect heads but also to magnetoresistance effect sensors.

Any one of the present invention may be provided not only in disc drive system but also other magnetic storage system, such as magnetic memory device. The magnetic disc drive system of the invention is characterized in that a current is applied to the magnetoresistance effect device in the magnetoresistance effect head to generate a magnetic field and that the system is provided with a mechanism capable of pinning the magnetization of the pinned magnetic layer in a predetermined direction in the thus-generated magnetic field.

Method for producing the magnetoresistance effect elements of the invention comprises heating the pair of ferromagnetic film A and the ferromagnetic film B of the synthetic pinned layer in a magnetic field, after the film of the giant magnetoresistance effect device has been formed

but before it is patterned, thereby pinning the magnetization of the pinned magnetic layer in a predetermined direction.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantage thereof is readily obtained as the same becomes better understood by reference to the following detailed description when taken in connection with the accompanying drawings, wherein:

Fig. 1 is a sectional view for explaining the film constitution of the first magnetoresistance effect device of the invention.

Fig. 2 is a transfer curve given by the first magnetoresistance effect device of the invention.

Fig. 3 is a graph of the Cu thickness of the high-conductivity layer adjacent to the free layer on the side opposite to the side at which the spacer is contacted with the free layer, versus the current magnetic field H_{cu} applied to the free layer.

Fig. 4 is a graph concretely showing the range of the pinned layer thickness and the nonmagnetic high-conductivity layer thickness for realizing asymmetry of from -10 % to +10 %, or that is, for realizing bias points of from 30 % to 50 %.

Fig. 5 is a sectional view of a typical film constitution of the first embodiment of the magnetoresistance effect device

of the invention.

Fig. 6 is a sectional view of a film constitution of the spin valve film of one example of the invention.

Fig. 7A and Fig. 7B are conceptual views for explaining two problems with conventional magnetoresistance effect devices.

Fig. 8 is a graph of calculated bias point values versus head reproducing signal waves.

Fig. 9 is an explanatory view indicating magnetic fields acting on a free layer.

Fig. 10 is a sectional view of a magnetoresistance effect film, in which are shown current flows I_1 to I_3 running through the layers.

Fig. 11 is a conceptual view showing the condition of the bias point in Comparative Case 1.

Fig. 12 is a conceptual view of the bias point versus H_{in} , H_{pin} and H_{cu} on a transfer curve.

Fig. 13 is a conceptual view showing the determinant factors for the bias point in Comparative Case 3.

Fig. 14 is a conceptual view showing the determinant factors for the bias point in Comparative Case 4.

Fig. 15 is a graph of the free layer thickness dependence of the bias point in the spin valve films of the invention, as compared with that in the spin valve films of Comparative Cases.